

Claims

We claim:

1 1. A method for maintaining a system for database management, the method comprising:
2 during splitting of a leaf block of a database index recording an address of a newly
3 created leaf block; and
4 maintaining the new address in a list as part of metadata of a primary B+tree.

2. The method according to claim 1, further comprising:
maintaining a measure of invalid guess-database block addresses by calculating a ratio of
a count of database block addresses in the list of new addresses to a total number of leaf blocks
of the primary B+tree.

3. The method according to claim 2, wherein the measure of invalid guess-database
block addresses applies to mapping tables and secondary indexes on the primary B+tree.

1 4. The method according to claim 2, wherein the list of database block addresses and the
2 ratio are maintained only when the ratio is less than a threshold value.

1 5. The method according to claim 4, wherein the threshold value for the ratio is about
2 10%.

1 6. The method according to claim 3, further comprising:
2 adjusting a guess-DBA quality of at least one of the mapping table and the secondary
3 index utilizing the ratio.

1 7. The method according to claim 4, wherein if the ratio is below the threshold value the
2 method further comprises:
3 selectively correcting entries in the mapping table and/or secondary index.

1 8. The method according to claim 7, wherein correcting entries in the mapping table
2 comprises for all rows in a list of blocks in the primary B+tree:
3 obtaining corresponding mapping table row identifiers and database block addresses of a
4 current block in the list;
5 sorting the corresponding mapping table row identifiers;
6 obtaining mapping table rows corresponding to the mapping table row identifiers; and
7 updating a guess-DBA component if it has changed.

1 9. The method according to claim 8, wherein the correcting is carried out on-line in a
2 piece-wise manner.

1 10. The method according to claim 4, wherein correcting entries in the secondary index
2 comprises for all rows in a list of blocks in the primary B+tree:
3 obtaining a secondary index key, a primary key and a database block address of a current
4 block in the list of blocks;

5 sorting the secondary index keys, primary keys and database addresses in order of
6 (secondary index key, primary key) pairs;
7 obtaining an index row corresponding to the (secondary index key, primary key) pair; and
8 updating a guess-DBA component of the index row if the guess-DBA has changed.

1 11. The method according to claim 11, wherein the correcting is carried out on-line in a
2 piece-wise manner.

1 12. The method according to claim 4, wherein if the ratio is above the threshold value
2 the method further comprises:
3 correcting guess-database addresses on a per object basis.

1 13. The method according to claim 12, wherein correcting guess-database block
2 addresses on the mapping table comprises:
3 performing a full scan of the mapping table;
4 determining for each row of the mapping table a correct guess-database block address by
5 traversing the primary B+tree up to a penultimate level;
6 updating each row of the mapping table with the correct guess-database block address;
7 and
8 committing the correct guess-database address to the mapping table in batches.

1 14. The method according to claim 12, wherein correcting guess-database block
2 addresses on a per object basis comprises for each secondary index object:

3 performing a full scan of the secondary index object;
4 determining for each row of the secondary index a correct guess-database block address
5 by traversing the primary B+tree up to a penultimate level;
6 updating each row of the secondary index with the correct guess-database block address;
7 and
8 committing the correct guess-database block address to the secondary index in batches.

1 15. The method according to claim 1, further comprising:
2 maintaining a list of database block addresses in the list.

3 16. A system for organizing a database index, the system comprising:
4 a list of addresses of blocks newly created during splitting of a primary B+tree.

5 17. The system according to claim 16, further comprising:
6 a count of database block addresses in the list.

7 18. The system according to claim 16, further comprising:
8 a ratio of count of database block addresses to total number of leaf blocks as a measure of
9 invalid guess-database block addresses.

1 19. The system according to claim 16, wherein the database index is a primary B+tree
2 structure, wherein the system further comprises:
3 a mapping table used to support bitmap indexes.

1 20. The system according to claim 19, further comprising:

2 a bitmap index supported by the mapping table.

1 21. The system according to claim 16, wherein the database index is a primary B+tree
2 structure, wherein the system further comprises:

3 a secondary index structure comprising hybrid row identifiers.

1 22. A computer program product for performing a process for maintaining a database
2 management system, comprising:

3 a computer readable medium; and

4 computer program instructions, recorded on the computer readable medium, executable
5 by a processor, for performing the steps of:

6 during splitting of a leaf block of a primary B+tree recording an address of a newly
7 created leaf block; and

8 maintaining the new address in a list as part of primary B+tree metadata.

1 23. A system for performing a process for maintaining a database management system,
2 comprising:

3 a processor operable to execute computer program instructions; and

4 a memory operable to store computer program instructions executable by the processor,
5 for performing the steps of:

6 during splitting of a leaf block of a primary B+tree recording an address of a newly

- 7 created leaf block; and
- 8 maintaining the new address in a list as part of primary B+tree metadata.

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